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Monte Carlo reconstruction of the inflationary potential Richard Easther easther@physics.columbia.edu
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abstract We present Monte Carlo reconstruction, a new method for "inverting" observational data to constrain the form of the scalar field potential responsible for inflation. This stochastic technique is based on the flow equation formalism and has distinct advantages over reconstruction methods based on a Taylor expansion of the potential. The primary ansatz required for Monte Carlo reconstruction is simply that inflation is driven by a single scalar field. We also require a very mild slow roll constraint, which can be made arbitrarily weak since Monte Carlo reconstruction is implemented at arbitrary order in the slow roll expansion. While our method cannot evade fundamental limits on the accuracy of reconstruction, it can be simply and consistently applied to poor data sets, and it takes advantage of the attractor properties of single-field inflation models to constrain the potential outside the small region directly probed by observations. We show examples of Monte Carlo reconstruction for data sets similar to that expected from the Planck satellite, and for a hypothetical measurement with a factor of five better parameter discrimination than Planck.